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ECONOMIC POLICY DIGEST

Economics of automation and jobs

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The 69th *Economic Policy* Panel Meeting, hosted by Eesti Pank, the central bank of Estonia, in Tallinn on 4-5 April 2019, includes five papers on automation, jobs, labour's share of income and BigTech firms in financial services. Their central findings are summarised in this issue of *Economic Policy Digest*.

AUTOMATION AND JOBS:

Labour-saving technologies can boost employment

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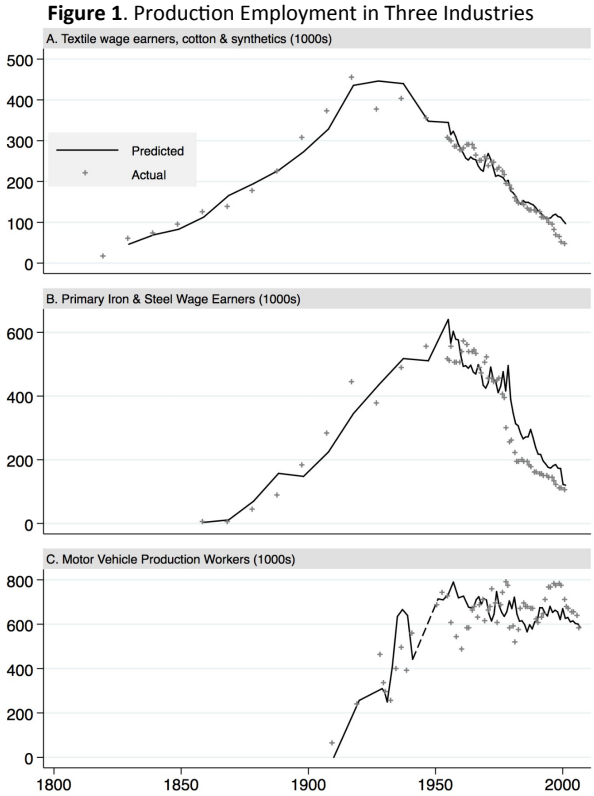
The policy challenge posed by new labour-saving technology is not mass unemployment but how to help workers to make the transition from industries, occupations and regions where automation has destroyed jobs to those where jobs have been created. That is the central conclusion of new research by *James Bessen*.

His study notes that while many people associate automation with a large-scale loss of jobs, as in many of today's manufacturing industries, in the early years of the cotton textile, primary steel and automotive industries, employment grew strongly along with automation for many decades (see Figure 1). The key question is whether today's technologies will boost employment, like the early textile and steel industries, or decrease employment in the affected industries, as has happened more recently.

Professor Bessen argues that the critical thing is the nature of consumer demand. In industries where demand is largely satiated – textiles, for example – there will be further job losses. But in industries that have not been heavily automated and which have significant unmet demand, the new technologies may bring job growth.

Figure 1. Production Employment in Three Industries



This suggests that new productivity-enhancing technologies will have disparate effects across industries – and many workers will need to shift to new ones. Such changes may be no less disruptive than mass unemployment, but they do call for policies to support workers making these transitions to provide them with new skills.

WHO IS AFRAID OF MACHINES?:

Evidence of technology-induced job losses and gains across 30 industries in 10 advanced countries

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Since the early 1980s, computer software and industrial robots have reduced the demand for low and medium-skill workers, the young and women, especially in manufacturing industries. But these technologies have raised the demand for high-skill workers, older workers and men, especially in service industries.

These are among the findings of new research by *Sotiris Blanas, Gino Gancia* and *Sang Yoon (Tim) Lee*. Their study

analyses data on 10 high-income countries and 30 industries, which roughly span their entire economies, with annual observations over the period from 1982 to 2005.

The results for women seem puzzling: even though women's labour market outcomes were improving over time, technology seems to have had a negative impact on their employment and relative incomes. The key to reconciling these facts lies in women's response over the medium run.

Robots did not replace women indiscriminately; rather, only those of lower levels of skill were replaced. At the same time, women responded by acquiring higher levels of skill, and at a faster rate than men. In similar vein, the positive effect of robots on men's outcomes is also because men were traditionally more educated.

The researchers highlight the importance of distinguishing between technologies that replace humans, such as robots and software, and those that are used by humans, such as information and communication technologies (ICT). The results suggest that all workers can enjoy the improvements in technology by acquiring new skills that are complementary to machines, rather than remaining in jobs that are destroyed by them.

COMPETITION FROM CHINA DRIVES FIRMS' INVESTMENT IN AUTOMATION:

Evidence from Danish manufacturing
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Firms facing strong competition from Chinese exporters are the ones making the biggest investments in automation technologies. That is one of the findings of new research by *Lene Kromann* and *Anders Sørensen*, which analyses survey data and evidence from factory visits on the surprisingly slow adoption of automated production capital in Danish manufacturing industries.

Their study shows that even though adoption of automation technologies clearly results in higher productivity, half of the firms surveyed still rely to a large extent on manual production processes.

The study identifies one driver of automation investments and that is for firms specialising in product types in which Chinese exporters have a comparative advantage. These firms seem to have had an incentive to invest more in automation. Other drivers are also possible but they are not identified in the study.

The researchers' finding that many firms do not adopt automation technologies is highly relevant for policy programmes that target automation. The close collaboration with industry experts and production managers, during firm visits, suggested that the low use of automation to some extent is due to a particular lack of the necessary skills and resources to investigate the firms' needs and possibilities for automation, as well as to make automation planning for the factory floor.

The production managers were not unaware that automation technologies existed. But they were lacking knowledge or awareness about the specific technologies in which they could invest, how to implement them and which processes of production to automate. In this sense, information barriers seemed to be an important market failure that potentially justifies policy intervention.

BIG TECHNOLOGY FIRMS IN FINANCIAL SERVICES:

New evidence of their emerging impact on competition, credit evaluation and clients' performance
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BigTech firms are entering finance, and their access to massive amounts of information may give them an edge in areas like credit and beyond. Using exclusive data from BigTech lenders, new research shows that these benefits may extend to borrowers too: the small business clients of BigTech lenders tend to have higher sales and a wider range of products than rival firms. BigTech lenders themselves thrive in countries with less competitive banks and less strict regulation.

The new study by *Jon Frost, Leonardo Gambacorta, Yi Huang, Hyun Song Shin and Pablo Zbinden** notes that while BigTech firms currently extend less than 1% of global private sector credit, their footprint is growing.

Most follow a well-worn path of broadening their activities into finance. They start with payments, in many cases overlaying such services on top of existing payments infrastructures. They then expand into lending, insurance and savings products, either directly or in cooperation with financial institutions. In a number of countries in Asia, Latin America, Europe and North America, BigTech firms now lend to millions of small and medium firms.

BigTech firms differ from banks in two key ways:

- First, they have a loyal client base in users of their e-commerce platforms, messaging services or search engine.
- Second, they use advanced technology – for example, artificial intelligence – to parse massive volumes of data. BigTech lenders can exploit data generated by their networks and machine learning to tailor prices and distribute financial services. Credit and other services are typically provided without human intervention.

The authors of the new study combine existing data on FinTech credit from the Cambridge Centre for Alternative Finance with hand-collected data on BigTech credit. They find that differences in the development of FinTech credit reflect differences in

income and financial market structure: the higher a country's income and the less competitive its banking system, the larger the FinTech credit activity. BigTech credit benefits even more from these factors.

The next strand of analysis focuses on credit assessment techniques. Using data from Mercado Libre and its lending product Mercado Crédito, the results show that credit models using machine learning and data from the e-commerce platform are better at predicting losses than traditional credit bureau ratings.

But the jury is still out. Any judgement on the ability of BigTech credit scoring to pinpoint creditworthiness more effectively should be based on a complete cycle, evaluating the probability of default in stress situations.

Finally, the study uses detailed micro data from Mercado Libre and Ant Financial to compare borrowers and their performance after accessing BigTech credit. The results show that small firms in Argentina that used BigTech credit offered more products and had higher sales than firms without credit in the following year. Small firms in China also offered more products.

The rapid growth of BigTech in finance will bring both benefits and risks to the financial system. BigTech firms may enhance competition and financial inclusion, and contribute to the efficiency of financial services. Conversely, such firms may further concentrate market power or give rise to new systemic risks.

Overall, it is important to understand how BigTech firms fit within the current framework of financial regulation, and under which principles regulation should be organised. All these are relevant aspects for future research in this area.

**The views expressed in the paper are solely those of the authors and do not necessarily represent the opinions of the Bank for International Settlements, the Financial Stability Board or Mercado Libre.*

LABOUR'S FALLING SHARE OF INCOME:

In advanced economies, technology is the key driver; in emerging economies, it is globalisation

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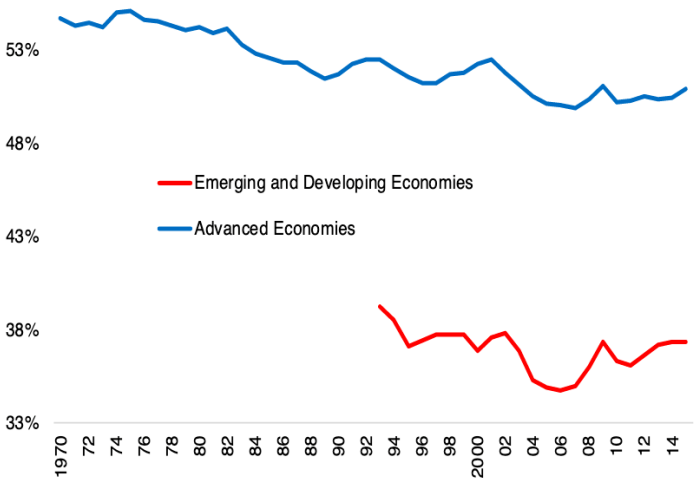
Across the world, labour seems to be losing out to capital: the share of income going to the workforce is declining not only in advanced economies, but also in emerging markets (see Figure 2).

Figure 2: Evolution of the Labour Share of Income



But while technological progress can account for much of this decline in advanced economies, this is not the case in emerging markets. There, it is globalisation, notably the deep integration of emerging markets in global value chains, which lies behind labour's falling share of income.

These are the central findings of research by *Mai Chi Dao, Mitali Das* and *Zsoka Koczan*. Their study shows that the steep global decline in the price of investment is largely an advanced economy phenomenon, whereas it has only declined mildly in emerging markets. Emerging economies also exhibit substantially lower initial exposures to 'routinisation', the share of employment that is vulnerable to being replaced by automation. These two facts result in a negligible impact of technological progress on labour shares in these economies.

What do these findings imply for policies? In advanced economies, they should help workers to cope better with disruptions caused by technological progress and global integration, including social safety nets, strong job search support, retraining programmes and well-designed temporary subsidies. But to the extent that some workers are permanently affected, longer-term redistributive measures might also be needed.

In emerging economies, in principle, the decline in labour shares may not by itself call for policy intervention. But as in advanced economies, policies should work to make access to opportunities as well as the gains from growth broadly shared. Moreover, challenges similar to those in advanced economies could arise as automation progresses.

The five papers featured in this digest are forthcoming.
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